JAN 31 1916

PACIFIC AMERICA

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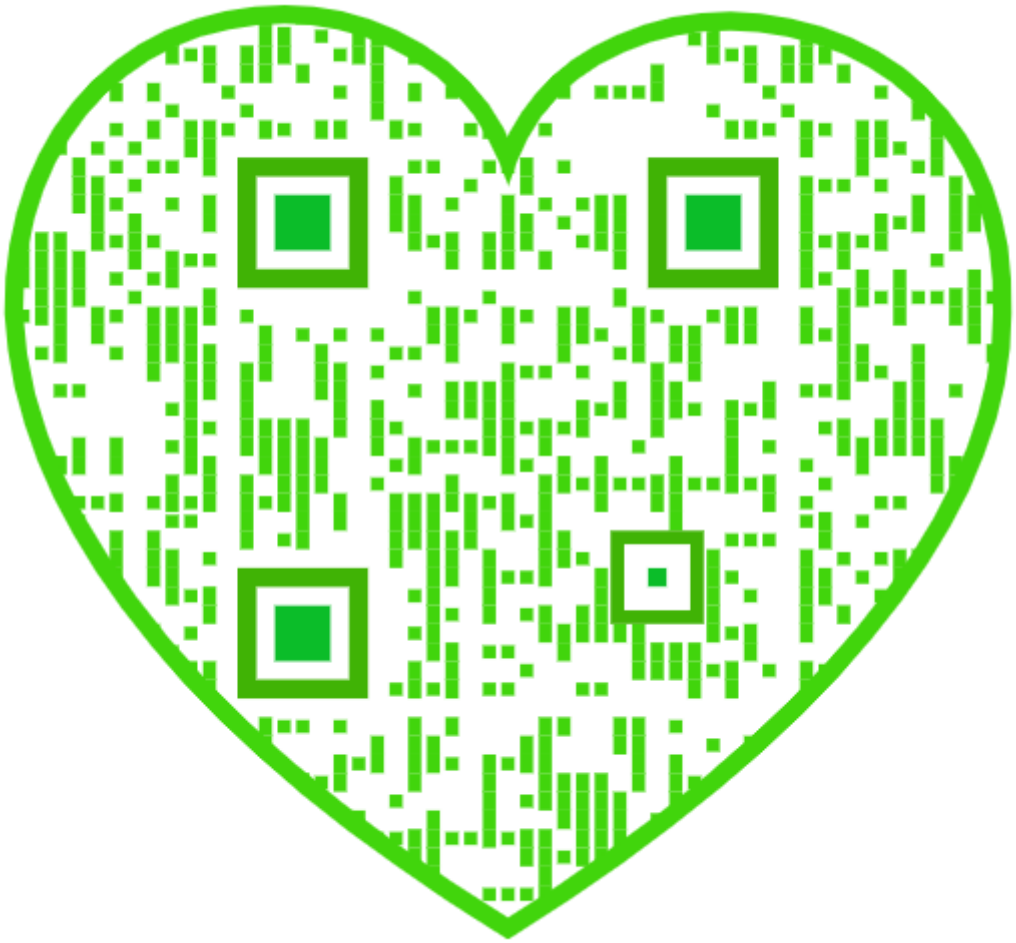
THE PHILIPPINE ISLANDS

ABACÁ (MANILA HEMP)

PANAMA PACIFIC INTERNATIONAL EXPOSITION SN. FRANCISCO CALIFORNIA



ABACÁ (MANILA HEMP) IN THE PHILIPPINES

(*Musa textilis.*)

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Introduction.—Abacá is not only the most important fiber, but also the most important export product, of the Philippines. For a number of years this fiber comprised approximately two-thirds of the total export trade of the Islands. The recent increase in the production of copra and sugar has reduced in a measure its relative importance, but it still remains our leading export product.

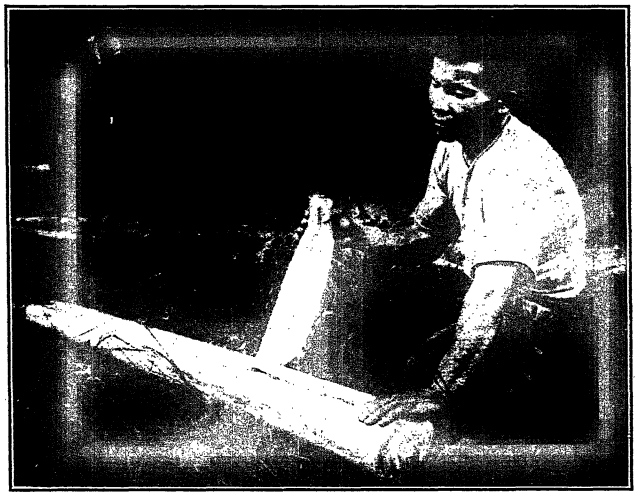
Abacá is the premier cordage fiber of the world. It is a structural (hard) fiber obtained from the outer layers of the overlapping leaf sheaths which form the stalks of the abacá plant. It is very light, strong, and durable. When properly extracted and dried, it is also of a white, lustrous color. One particular feature of the abacá fiber which emphasizes its superiority over all other fibers of its class is its great strength and its resistance to the action of water, hence its particular adaptability for marine ropes.

In the commercial world this fiber is known as "manila hemp" or "manila." It is often called "hemp," especially locally by the English-speaking community, but this term is both incorrect and misleading, and its use should be discontinued in favor of the Spanish–Filipino term "abacá."

History of the industry.—The first authentic account of the use of either abacá or banana fiber in the Philippines is that given by an Englishman, Dampier, who lived in Mindanao in 1686. This writer describes the "banana textoria," both as an edible

Sixteen-months-old abacá (manila hemp) plants, grown by modern methods, La Carlota experiment station, Occidental Negros.

and as a fiber-producing plant.[1] One of the companions of Magellan, Antonio Pigafetta, prepared a description of the plants of the Philippines, but in this paper no mention is made of abacá. The fiber was first exported from the Islands about the beginning of the last century, but the export did not become important until about 1850. In 1820 a sample of abacá was brought to Salem, Mass., by John



Stripping abacá (manila hemp) first process, Albay.

White, a lieutenant in the United States Navy. From 1824 to 1827 the fiber began to be used quite extensively in Salem and Boston.[2]

The production of abacá for export did not commence until 1818, when 41 tons were exported. Until 1830 the exports ranged from 100 to 500 tons; but in 1840 they increased to 8,502, or an increase of 8,000 tons in about ten years. During the ten years from 1840 to 1850, the exports remained prac-

[1] Probably confusing abacá with banana. The two plants belong to the same genus, *Musa*, of which many species are known to science.

[2] From Bureau of Agriculture Bulletin No. 12, page 10, Manila, P. I.

tically stationary, amounting to 8,561 tons in the latter year. The decade from 1850 to 1860 shows an increase from 8,561 tons to 30,388; while that from 1860 to 1870 shows an increase of from 30,388 to 31,426, or about 1,100 tons only. From 1870 until 1900, the exports increased from 31,426 to 89,438 tons, with an average increase of about 20,000 tons during each decade.

The quantity and value of the exports of abacá from the Philippines since the fiscal year ending June 30, 1900, are as follows:

[Values in U. S. currency.]

Fiscal year ending June 30—	All countries.		Percentage of total exports.	Average local value per ton.
	Quantity.	Value.		
	Met.tons[a]			
1900	76,709	$11,393,883	52.6	$148.53
1901	112,215	14,453,110	54.6	128.80
1902	109,969	15,841,316	58.3	144.05
1903	132,242	21,701,575	54.7	164.10
1904	131,818	21,794,960	58.8	165.34
1905	116,733	22,146,241	59.6	189.72
1906	112,165	19,446,769	59.5	173.38
1907	114,701	21,085,081	61.7	183.83
1908	115,829	17,311,808	52.7	149.46
1909	149,992	15,833,577	51.0	105.56
1910	170,789	17,404,922	43.6	101.91
1911	165,650	16,141,340	40.5	97.44
1912	154,047	16,283,510	32.3	105.70
1913	144,576	23,024,744	43.2	159.25
1914	132,873	22,375,106	44.8	168.39

[a] One metric ton equals 2,204.62 avoirdupois pounds.

During the whole history of the abacá industry, the fiber has been identified with the Philippines. This is due to the fact that the introduction of the abacá plant into other tropical countries, in both the Eastern and the Western Hemispheres, has not resulted in any considerable degree of success, and the fiber is still, as it always has been, distinctly a Philippine product.

Distribution.—Abacá is distributed throughout the greater part of the Philippine Archipelago. The provinces and islands which are most favorable for the growth of the plant and where the greater part of the commercial fiber is produced are the following: Southern Luzon, comprising the Provinces of Ambos Camarines, Albay, and Sorsogon; Leyte, chiefly the northeastern and southern parts; Samar, chiefly the northern and southeastern parts; and Mindanao, comprising the Provinces of Moro, Misamis, Surigao, and Agusan. The plant is also cultivated to some extent in the Islands of Negros, Cebu, Mindoro, Panay, and Marinduque. The most northern limit of the cultivation of abacá is central southern Luzon, comprising the Provinces of Cavite, Laguna, and Batangas.

During the fiscal year ending June 30, 1913, the total area under cultivation in abacá throughout the Philippine Islands was about 909,849 acres, distributed among the provinces as follows: Albay, 219,155; Ambos Camarines, 171,018; Sorsogon, 157,815; Leyte, 110,948; Samar, 68,143; Moro, 48,254; Misamis, 35,167; Surigao, 14,376; and the remaining provinces, 84,973.

Climate and soil.—The structure of the abacá plant and its habits of growth are such that a large and constant supply of moisture is required. The most important abacá provinces have, as a rule, a heavy and evenly distributed rainfall. The actual amount of rainfall required by the abacá plant is not very large, but it is essential that it be evenly distributed throughout the year. In districts having a long and pronounced dry season, irrespective of the annual amount of rainfall, the cultivation of abacá can not be successfully carried on unless water is available for irrigation.

The abacá plant requires a warm climate, and for this reason its successful cultivation can be accomplished only in tropical countries and below an ele-

vation of 1,000 meters (3,280 feet.) Cold climates are detrimental to the plant, both in regard to the extent of its growth and the development of its fiber. Extreme heat, on the other hand, appears to affect

Abacá (manila hemp), Sinaba and Tangongon varieties, Davao, Mindanao.

the plant unfavorably, probably because it causes excessive and rapid evaporation of moisture both from the leaves and the soil, especially during the driest period of the year.

The abacá plant with its heavy broad leaves is very often seriously injured by strong winds. It is, therefore, always desirable to select localities which are naturally protected from such winds, especially in all provinces lying within the typhoon belt. If natural barriers are not available, windbreaks must be planted along the exposed side or sides and also at intervals among the plants.

Next in importance to favorable climatic conditions is the selection of a suitable soil. The suitability of any particular type of soil of necessity depends, on the one hand, on the climatic conditions, and on the other, on the location. For instance, in a certain location where the land is low and where a heavy rainfall occurs, a certain soil would become oversaturated, while the same type of soil, if the land were higher and the rainfall less abundant, might be sufficiently well drained.

Throughout the important abacá districts the plantations are situated on the lower slopes of volcanoes or other mountains. The soils in such locations are, as a rule, deep, fertile, and well drained. Besides being well drained, the soil should be of lasting fertility, as abacá is grown on the same land for a period of ten to fifteen years without replanting, rotation, or fertilization. This exposes the soil to a long drain on its resources. Besides having lasting fertility, the soil should also be of medium consistency so as to allow the plant to benefit by the constant supply of moisture without the soil becoming oversaturated.

Description of the plant.—The abacá is a perennial plant 5 to 10 meters (16½ to 33 feet) high. When mature it consists of a group, or cluster, of from 12 to 30 or more stalks of different stages of development. The stalk is cylindrical, 2½ to 6 meters (8 to 20 feet) long, and is formed by the overlapping of the leaf sheaths. The sheaths grow from the fleshy, central core, which is the real stalk, until the

sheath formation is completed, when the flower bud developes and forms the flowering spike. The flowers are borne in clusters subtended by a large membranous bract. The first few bracts which subtend

Eleven-months-old abacá plant, Laguis variety of Leyte, at La Carlota experiment station, Occidental Negros.

the real flowers are larger and more conspicuous than the rest which subtend the false flowers. The latter bracts are so densely laid upon one another as to form a kind of flower cone. This cone is smooth, glossy, and of a color ranging from purple to light

green. The fruit is green, 5 to 6 centimeters (2 to 2½ inches) long, 1½ to 2 centimeters (0.59 to 0.78 inches) in diameter, inedible, and filled with black seeds.

The abacá plant closely resembles the banana. To the inexperienced eye, it is rather difficult to distinguish the one from the other. The abacá is ordinarily smaller than the banana and its stalks are, as a rule, more slender than those of the latter. The abacá leaf is darker green, narrower, and more tapering than that of the banana. The petiole (leaf stalk) of the abacá leaf is of a light-green color, while that of the banana is grayish.

Stalk formation.—The abacá stalk consists of a fleshy central core and a number of overlapping sheaths. This core is a continuation of the fleshy part of the rootstock, and, as it grows, sheaths are formed on its sides, chiefly at the base. When the stalk reaches maturity sheath formation stops, but the core keeps growing and forms what is known as the "flower spike." The central core, therefore, is really the flower stalk, and its sheaths are prolongations of the petioles of the leaves. This core diminishes in diameter as it rises in the middle of the stalk. Its diameter at the base of the stalk varies from 15 to 35 centimeters (6 to 14 inches), and at the top it rarely exceeds 5 centimeters (2 inches).

The stalk consists of 12 to 25 sheaths, depending on the variety and the extent of growth. The central sheaths alone are exactly the same length as the stalk. The exterior sheaths rise from the base of the core but do not extend to the top of the stalk, and the interior ones, which extend to the top of the stalk, do not rise from the base but at variable intervals above it.

Fiber extraction.—The abacá plant when mature consists of a group of 12 to 30 stalks. These stalks are in all stages of development, but usually two to

four only can be harvested at the same time. The stalk is mature at the time of the appearance of the blossom, or shortly before. As a rule no cutting should commence before the plant is 2 to 3 years old. After the first harvest subsequent cuttings can be made every four or six months.

The process of fiber extraction consists of two distinct operations: First, the removal of the ribbon-like fibrous strips from the sheath; and, second, the separation of the individual fibers by pulling these strips under a knife.

The laborer, sitting on the ground with a stalk in front of him, inserts a small, sharp piece of bone or bamboo into the sheath, separates the fibrous strip and pulls it off in two to four ribbons, varying from 5 to 8 centimeters (2 to 3.14 inches) in width and as long as the sheath itself. When these ribbons have been separated, the remainder of the sheath is removed and thrown away as waste. Each consecutive sheath is thus worked until the central core of the stalk is reached.

When a sufficient quantity of these fiber strips, or ribbons, has been collected, they are tied in bundles and carried to the stripping apparatus, which consists of a log set in a horizontal position $\frac{1}{2}$ to 1 meter ($1\frac{1}{2}$ to 3 feet) from the ground, on top of which is fastened a level block of smooth, hard wood or bamboo. Over this block is placed a knife about 30 centimeters (12 inches) long with a handle 40 centimeters (16 inches) long. Every strip is passed under the knife twice, the second time to pull the butt end which the operator holds in his grasp during the first pull. This process of drawing under the knife removes all the pulp, leaving in the hands of the operator a bunch of clean, white fiber. As soon as the strips are cleaned, the fiber is hung over a bamboo pole to dry.

Practically all of the fiber produced in the Philippine Islands is extracted with this simple appara-

tus. The strength and color of the fiber—two most important qualities—are determined largely by the manner in which it is cleaned. Three factors in the process affect the quality of the product—the condition of the knife blade, the degree of pressure with which the knife is held upon the block, and the manner of drying the fiber. With a serrated knife loosely fastened the fibers are only partially separated and only a portion of the pulp is removed, the work is easy, the yield large, but the fiber is inferior in quality. With a knife having a smooth-edged blade and held firmly on the block, the work of extraction is somewhat more difficult and the waste greater, but a very superior fiber is obtained. Prompt and thorough drying will give the fiber its white and lustrous color.

Yield and value.—From 400 to 500 abacá plants are usually planted to the acre. Each plant, or hill, consists of several stalks, three to five of which can be harvested annually. The yield of fiber per acre varies considerably, but under normal conditions and by proper treatment an average of one-half ton of dry fiber can be obtained. The quality of the fiber also varies considerably depending on the amount of care taken in cleaning the fiber and in handling it prior to and after extraction. The average quality, however, should be at least "good current," which at the present writing is valued at ₱440 ($220) per ton in Manila.[1] The gross income from an acre of land planted to abacá at the present time may therefore be estimated at ₱220 ($110). The normal value of "good current" abacá may be placed at ₱400 ($200) per ton, thus making the gross income from 1 acre during normal times at about ₱200 ($100).

The cost of bringing to maturity 1 acre of land planted to abacá is estimated at ₱100 ($50), including rental of land, clearing of forest, wages and salaries, and other expenses. The cost of subse-

[1] Written before the outbreak of the present European war.

quent cultivation is estimated at ₱10 to ₱12 ($5 to $6) per acre. The cost of harvesting, fiber extraction, and marketing of the product ranges from ₱175 to ₱200 ($87.50 to $100) per ton, or ₱87 to ₱100

Stripping abacá (manila hemp), second process, Davao, Mindanao.

($43.50 to $50) per acre. During normal prices the net income will be about ₱90 ($45) per acre per annum.

Description and uses of the fiber.—Abacá fiber is very light, strong, and durable. When properly extracted and dried, it is also of a white, shining color.

It divides easily into smaller fibers of a regular diameter. The central cavity, or lumen, is both large and apparent. The walls of this cavity are of uniform thickness, and its form generally resembles the form of the whole fiber, which is in most cases oval. The end of the fiber tapers gradually and the point is acicular or slightly rounded.

The chief uses made of abacá are in the manufacture of marine cordage of various sizes and grades, oil-drilling rope, binder twine, trawl twine, tarred lathe, and tagal braid and textiles.

The manufacture of marine cordage takes the bulk of abacá fiber, perhaps not less than 75 per cent of the total production. The grades of the fiber used for this purpose depend on the grade of the rope made, and also on the country where the rope is manufactured. The United States uses higher grades of fiber than Great Britain and other European countries.

In the manufacture of oil-drilling rope only the higher grades are used, perhaps little or none under "good current."

The use of abacá in binder twine has recently been declining due, first, to the scarcity of the middle and higher grades of abacá and their consequent rise in price; and, second, to the increase in the production of henequen and other sisal fibers, which are more uniform in quality than abacá, and which, though not as strong and durable as the latter, yet are strong enough for binder twine. Perhaps not more than 10 per cent of the total supply of abacá is now being used for binder twine.

Trawl twine is made from abacá of the grades good current and above. For this purpose the fine and soft fiber is particularly required.

Tarred lathe is made of the lower grades of the well-cleaned (soft) abacá, and such ropes are used for hauling lumber at the lumber mills, and for other similar purposes.

The manufacture of tagal (hat) braid is of a comparatively recent origin. Only the highest grades of abacá are used for this purpose, and Japan is by far the largest buyer of the raw fiber. Some European countries buy these high grades, knotted and twisted into hanks, or rolled on bobbins or spools. About 4 or 5 per cent of the supply of abacá is used for this purpose.

Recent development of the industry.—From the early history of the abacá industry until the present time the production of fiber has increased steadily. Unfortunately, however, this increase in production was not the result of, nor was it accompanied by, any general improvement in the cultivation of the plant or in plantation management. Until a short time ago, and in a large measure even at the present time, the bulk of production is the product of small plantings in which old and crude methods of cultivation and fiber extraction have been used. Under such conditions, therefore, it is not surprising that for a long time it was the belief that the cultivation and production of abacá was not an industry that could be profitably carried on by the use of systematic and modern methods of agriculture.

Since 1903, however, several large plantations have been established in different localities and improved methods used in the cultivation of the plant and in general management. The results have shown that the abacá industry can be made one of the most profitable branches of investment for the tropical agriculturist. The abacá plant responds freely to careful and methodical treatment by a considerable increase in the yield of fiber, and the carefully extracted fiber commands a steady demand and a high price, even during the so-called dull periods of the market. As a result of this investigation there has recently been a tendency toward the substitution of modern methods of culture and

management to replace the former wasteful and antiquated practices.

The opportunities for the extension of the abacá industry of the Philippines, not so much in an increase in the area cultivated or an increase in production, but in an increase in the yield of plants and an improvement in the quality of the product, are very promising. Improved methods of culture and fiber extraction will largely increase the production of fiber on some of the land already cultivated, while large areas now covered with forest are in every way suitable for abacá and are available for prospective planters. With but little or no danger from insect pests or plant diseases and with but little or no competition from other countries, abacá is an eminently safe crop and affords one of the most profitable branches of agriculture in the Philippines.

Further information on this subject may be obtained from the director-general of the Philippine Exposition Board, Panama-Pacific Exposition, or by application to the Director of Agriculture, Manila, P. I.